NASA THESAURUS SUPPLEMENT

A three-part cumulative update of the
1998 edition of the *NASA Thesaurus*

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A three-part cumulative update of the
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**National Aeronautics and
Space Administration**

January 1999

Table of Contents

Introduction

This Supplement is a cumulative update to the 1998 edition of the *NASA Thesaurus* (NASA/SP—1998-7501). The update includes all new terms and associated hierarchies added between the cut-off for the 1998 edition (December 1997) through January 1, 1999. Parts 1 and 2 of this *Supplement* correspond to Volumes 1 and 2 of the printed edition of the *NASA Thesaurus*. Supplements are normally published every six months.

Part 1 (*Hierarchical Listing*) contains the full hierarchical structure for each new term along with all new cross references. Term definitions, previously presented as Part 3 of past supplements, have been integrated into the Part 1 listing.

Display elements comprising the hierarchical listing are as follows:

Display Element	Notation
Generic Structure	GS
Related Term	RT
Use	USE
Use For	UF
Scope Note	SN
Definition	DEF
Array Terms	∞

For a fuller explanation, see the Introduction (pages viii–xi) in the printed version of the 1998 *NASA Thesaurus*, Volume 1.

Part 2 (*Rotated Term Display*) is a ready reference tool which provides additional 'access points' to the thesaurus terminology. It contains the postable terms and nonpostable cross references found in the Hierarchical Listing (Part 1) arranged in a KWIC (key-word-in-context) index.

Part 3 (*Changes*) is a listing of deletions or changes to postable terms or USE references made since the 1998 edition of the *NASA Thesaurus*. To control the size of the Supplement, only significant changes in term hierarchies and related term lists are presented.

NOTE: Other resources and products related to the NASA Thesaurus can be found at the following URL: **http://www.sti.nasa.gov/thesfrm1.htm**.

In addition to the above mentioned resources, a thesaurus listserv has been set up for submitting candidate terms and discussion of related lexicographical issues. A listing of candidate and accepted new terms is posted monthly. To subscribe to this listserv, send an e-mail message to **listserv@sti.nasa.gov**. Leave the subject line blank and in the message section, type **SUBSCRIBE THESAURUS–L <Your name>**. (Should you wish to cancel your subscription, send a message to the same address with UNSUBSCRIBE in the message section.)

Comments and suggestions regarding the NASA Thesaurus should be directed to:

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Fax: (301) 621–0134
Telephone: (301) 621–0114

NASA THESAURUS SUPPLEMENT

PART 1
HIERARCHICAL LISTING

A

Alpha Magnetic Spectrometer
(added June 1998)
UF   AMS (spectrometer)
GS   measuring instruments
         spectrometers
            Alpha Magnetic Spectrometer
RT   antimatter
         Cerenkov counters
         cosmic rays
         dark matter
         International Space Station
         interstellar matter
         magnetic spectroscopy
         space station payloads
         spaceborne astronomy

AMS (spectrometer)
USE   **Alpha Magnetic Spectrometer**

antenna gain
(added June 1998)
GS   amplification
            antenna gain
RT   antennas
         automatic gain control
         directional antennas
         effectiveness
         high gain
         signal reception

antiphase boundaries
(added March 1998)
UF   antiphase domains
         APB (materials)
GS   boundaries
            antiphase boundaries
RT   binary alloys
         crystal dislocations
         crystal lattices
         crystal structure
         grain boundaries
         interfacial energy
         intermetallics
         microstructure
         order-disorder transformations
         solid solutions
         solid-solid interfaces
         superlattices
         ternary alloys

antiphase domains
USE   **antiphase boundaries**

APB (materials)
USE   **antiphase boundaries**

B

Biot-Savart law
(added August 1998)
DEF   Law describing the intensity of a
magnetic field produced by a current carrying wire.
Also applied in fluid dynamics to describe the
flow-velocity field induced by a vortex.
GS   laws
            Biot-Savart law
RT   electromagnetism

         flow velocity
         magnetic fields
         Maxwell equation
         vortices

Boeing 717 aircraft
(added October 1998)
GS   Boeing aircraft
            Boeing 717 aircraft
         commercial aircraft
            Boeing 717 aircraft
         jet aircraft
            turbofan aircraft
               Boeing 717 aircraft
         monoplanes
            Boeing 717 aircraft
         passenger aircraft
            Boeing 717 aircraft
         transport aircraft
            Boeing 717 aircraft
RT   aircraft

bohrium
(added May 1998)
GS   chemical elements
            bohrium
RT   hassium
         seaborgium

C

cascode devices
(added August 1998)
DEF   Amplifier devices consisting of a
common grounded-emitter (cathode) or source
stage that drives a grounded-base output stage,
resulting in high-impedance, high-gain and
low-noise.
GS   amplifiers
            cascode devices
         electronic equipment
            solid state devices
               semiconductor devices
                  cascode devices
RT   CMOS
         field effect transistors
         high electron mobility transistors
         switching circuits
         transistor amplifiers
         transistor circuits
         transistors

clamped structures
(added February 1998)
RT   beams (supports)
         clamps
         composite structures
         joints (junctions)
         laminates
         plates (structural members)
         shells (structural forms)
         structural members
         structural vibration
         structures

corrugated waveguides
(added February 1998)
GS   waveguides

            corrugated waveguides
RT   gratings (spectra)
         optical waveguides
         waveguide antennas

cycloaddition
(added June 1998)
DEF   Pericyclic chemical reaction in which
unsaturated molecules combine to form a cyclic
compound under the influence of heat or light.
GS   chemical reactions
            cycloaddition
               Diels-Alder reactions
RT   cyclic compounds
         photochemical reactions
         polymerization
         synthesis (chemistry)

D

Darkstar unmanned aerial vehicle
USE   **pilotless aircraft**
            reconnaissance aircraft

Deep Space 1 Mission
(added October 1998)
DEF   First of several technology demon-
stration missions supporting the NASA New
Millennium Program. Advanced technologies
include an ion propulsion system, solar con-
centrator arrays, autonomous navigation and
control systems, an integrated camera and
imaging spectrometer, and several telecommun-
ications and microelectronics devices. The
mission plan includes a flyby of Asteroid 1992 KD.
UF   DS1 (space mission)
GS   space missions
            Deep Space 1 Mission
RT   asteroid missions
         autonomous navigation
         flyby missions
         interplanetary spacecraft
         ion propulsion
         NASA space programs
         solar electric propulsion

deformable mirrors
(added May 1998)
GS   mirrors
            deformable mirrors
RT   adaptive optics
         light modulation
         phase modulation
         segmented mirrors

Delta 3 launch vehicle
(added October 1998)
GS   launch vehicles
            Delta launch vehicle
               Delta 3 launch vehicle

Delta 4 launch vehicle
(added October 1998)
GS   launch vehicles
            Delta launch vehicle
               Delta 4 launch vehicle

dielectric waveguides
(added February 1998)
GS   waveguides
     dielectric waveguides
RT   dielectrics
     microwave transmission
     optical waveguides
     waveguide antennas
     waveguide filters

differential games
(added October 1998)
GS   games
     differential games
RT   minimax technique
     optimal control
     pursuit-evasion games
     stochastic processes
     zero sum games

digital cameras
(added July 1998)
GS   optical equipment
     cameras
     digital cameras
     photographic equipment
     cameras
     digital cameras
RT   CCD cameras
     digital systems
     digital techniques
     photogrammetry
     television cameras
     video equipment

DS1 (space mission)
USE   **Deep Space 1 Mission**

dubnium
(added May 1998)
GS   chemical elements
     dubnium
RT   rutherfordium
     seaborgium

E

EAM (physical chemistry)
USE   **embedded atom method**

embedded atom method
(added February 1998)
DEF   A semiempirical calculation method developed by Daw and Baskes for determining the energetics of atoms in a bulk environment. The original form of the method was based on density functional theory and was intended primarily for tight-packed transition metals. More recent modifications have extended the applicability of the method to a large number of elements in the periodic table.
UF   *EAM (physical chemistry)*
     MEAM (physical chemistry)
     modified embedded atom method
RT   alloys
     crystal defects
     grain boundaries
     interatomic forces
     metals
     methodology
     molecular dynamics
     potential energy

enantiomeric compounds
USE   **enantiomers**

enantiomers
(added August 1998)
DEF   Isomeric pairs whose crystalline forms or molecular structures are non-superimposable mirror images.
UF   *enantiomeric compounds*
     enantiomorphs
GS   isomers
     enantiomers
RT   chirality
     crystal structure
     isomorphism
     molecular structure
     stereochemistry
     symmetry

enantiomorphs
USE   **enantiomers**

Euler-Bernoulli beam theory
USE   **Euler-Bernoulli beams**

Euler-Bernoulli beams
(added April 1998)
UF   *Euler-Bernoulli beam theory*
GS   structural members
     beams (supports)
     Euler-Bernoulli beams
RT   axial strain
     bending
     bending vibration
     dynamic structural analysis
     elastic properties
     mathematical models
     partial differential equations
     structural analysis
     Timoshenko beams

evanescent waves
(added March 1998)
GS   surface waves
     evanescent waves
RT   acoustic impedance
     evanescence
     fiber optics
     internal waves
     plane waves
     propagation modes
     reflected waves
     wave propagation
     waves

F

ferroelastic materials
(added June 1998)
GS   **ferroelastic materials**
     shape memory alloys
     nitinol alloys
RT   ceramics
     ferroelasticity
     ferroelectric materials
     materials
     smart materials

ferroelasticity
(added June 1998)
GS   mechanical properties
     elastic properties
     ferroelasticity
RT   crystal structure
     domain wall
     ferroelastic materials
     ferroelectricity
     phase transformations
     shape memory alloys
     smart materials

field tests
(added November 1998)
SN   (EXCLUDES TESTS OF ELECTRIC, MAGNETIC, OR ELECTROMAGNETIC FIELDS)
DEF   Tests carried out in the actual setting in which the subject device is intended to operate
RT   environmental tests
     performance tests
     tests

free-space optical communication
(added June 1998)
GS   telecommunication
     communication
     optical communication
     free-space optical communication
RT   high power lasers
     laser beams
     satellite communication
     space communication

free-space optical interconnects
(added June 1998)
UF   *FSOI (integrated optics)*
GS   optical interconnects
     free-space optical interconnects
RT   integrated optics
     interprocessor communication
     optical computers
     optical switching
     optoelectronic devices
     photonics

FSOI (integrated optics)
USE   **free-space optical interconnects**

fullerides
(added February 1998)
GS   carbon compounds
     fullerides
RT   alkali metal compounds
     chemical compounds
     doped crystals
     fullerenes
     superconductors (materials)

fuselage-wing stores
USE   **wing-fuselage stores**

G

Gabor filters
(added February 1998)
GS   image filters
     Gabor filters
RT   computer vision
     filters
     Gabor transformation
     image analysis
     image processing
     low pass filters
     neural nets
     spatial filtering
     textures

Gabor transformation
(added February 1998)
GS   transformations (mathematics)
     Gabor transformation
RT   Fourier transformation
     Gabor filters
     holography
     image processing
     signal analysis
     wavelet analysis

games
(added October 1998)
GS   **games**
          differential games
          pursuit–evasion games
          war games
          zero sum games
RT   control theory
          game theory
          optimization

Godunov method
(added February 1998)
DEF   Non–oscillatory finite–volume scheme
that incorporates the exact or approximate solution
to the Riemann initial–value problem, or a
generalization of it
GS   analysis (mathematics)
          numerical analysis
             finite volume method
                Godunov method
          procedures
             finite volume method
                Godunov method
RT   approximation
          Cauchy problem
          Cauchy–Riemann equations
          computational fluid dynamics
          Euler equations of motion
          finite difference theory
          shock wave interaction
          supersonic flow

H

H–2 control
(added February 1998)
GS   automatic control
          optimal control
                H–2 control
          optimization
             optimal control
                H–2 control
RT   control systems design
          control theory
          controllers
          feedback control
          H–infinity control
          linear quadratic Gaussian control

Hale–Bopp comet
(added July 1998)
DEF   Long–period comet discovered July 23,
1995; designated C/1995 O1
GS   celestial bodies
          comets
                Hale–Bopp comet
RT   Oort cloud

hassium
(added May 1998)
GS   chemical elements
                hassium
RT   bohrium
          meitnerium

head up tilt
(added March 1998)
DEF   Body posture while lying on a tilt table
with the head higher than the rest of the body
UF   *HUT (physiology)*
GS   posture
                head up tilt
RT   aerospace medicine
          bed rest
          bioastronautics
          cardiovascular system

          gravitational physiology
          head down tilt
          hemodynamic responses
          lower body negative pressure
          orthostatic tolerance
          physiological responses
          supine position
          weightlessness simulation

HUT (physiology)
USE   **head up tilt**

hybrid–Trefftz finite element method
USE   **finite element method**
          Trefftz method

hypothetical planets
(added June 1998)
UF   *Phaethon (hypothetical planet)*
          planet X
          transplutonic planets
GS   celestial bodies
          planets
                hypothetical planets
RT   comets
          extrasolar planets
          planetary orbits

I

inflight simulation
USE   **in–flight simulation**

in–flight simulation
(added October 1998)
DEF   The use of a specialized test aircraft to
simulate the flight characteristics of another
vehicle. The test aircraft is typically capable of
duplicating the computed responses of the
simulated vehicle through special aerodynamic
and control system features
UF   *inflight simulation*
GS   simulation
          flight simulation
                in–flight simulation
RT   aircraft control
          flight characteristics
          flight control
          flight simulators
          flight tests
          training simulators

intelligent materials
USE   **smart materials**

ion optics
(added June 1998)
RT   beam waveguides
          beamforming
          electron optics
          ion beams
          ion engines
          ion propulsion
          mass spectrometers
          optics

Iridium network
(added December 1998)
DEF   A 66–satellite wireless personal
telecommunications network designed to provide
worldwide telephone, paging, facsimile and data
services to handheld or mobile equipment
UF   *Iridium satellites*
GS   networks
          communication networks
                Iridium network
          satellite networks
             satellite constellations

                Iridium network
RT   communication satellites
          facsimile communication
          mobile communication systems
          satellite communication
          telephony
          wireless communication

Iridium satellites
USE   **communication satellites**
          Iridium network

J

Java (programming language)
(added December 1998)
GS   languages
          programming languages
             high level languages
                Java (programming language)
RT   C++ (programming language)
          client server systems
          internets
          object–oriented programming
          World Wide Web

K

kink bands
(added March 1998)
RT   buckling
          compression loads
          edge dislocations
          failure modes
          fiber composites
          microstructure
          plastic deformation
          reinforcing fibers
          single crystals

kinking
(added April 1998)
RT   bending
          buckling
          compression loads
          cracking (fracturing)
          deformation
          displacement
          failure modes
          fiber composites
          folding
          heaving
          twisting
          wrinkling

L

Laves phases
(added August 1998)
GS   solid phases
                Laves phases
RT   alloys
          crystal lattices
          crystal structure
          cubic lattices
          interstitials
          microstructure
          phase transformations

Lunar Prospector
(added February 1998)
GS   artificial satellites
          lunar satellites
                Lunar Prospector
          lunar spacecraft

lunar satellites
Lunar Prospector
RT lunar composition
lunar exploration
lunar programs
lunar resources
lunar surface

M

Martian meteorites
USE **SNC meteorites**

MEAM (physical chemistry)
USE **embedded atom method**

meitnerium
(added May 1998)
GS chemical elements
meitnerium
RT hassium

MEMS (electromechanical devices)
USE **microelectromechanical systems**

microelectromechanical systems
(added October 1998)
UF *MEMS (electromechanical devices)*
GS electromechanical devices
microelectromechanical systems
RT microinstrumentation
microminiaturization
microminiaturized electronic devices
microsatellites
nanosatellites

microsatellites
(added October 1998)
DEF Satellites with a total mass between 10
and 100 kg, often incorporating miniaturized
electronic and mechanical systems
UF *microsats*
GS artificial satellites
microsatellites
RT microelectromechanical systems
microminiaturization
microminiaturized electronic devices
nanosatellites
satellite constellations
satellite design
small satellite technology
small scientific satellites

microsats
USE **microsatellites**

Mindlin plate theory
USE **Mindlin plates**

Mindlin plates
(added April 1998)
UF *Mindlin plate theory*
Reissner–Mindlin plates
GS structural members
plates (structural members)
Mindlin plates
RT dynamic structural analysis
finite element method
free vibration
plate theory
Reissner theory
shear strain
structural analysis
structural vibration
thick plates

mischmetal
(added June 1998)
DEF An alloy consisting of a natural mixture
of rare–earth metals; used in electrode materials
and hydrogen–storage alloys, as a general alloy
addition, and in the production of some aluminum
alloys and steels
GS alloys
rare earth alloys
mischmetal
RT alloying
aluminum alloys
cathodic coatings
cerium
desorption
electrode materials
intermetallics
steels

modified embedded atom method
USE **embedded atom method**

N

nacelle wing configurations
USE **wing nacelle configurations**

nanosatellites
(added October 1998)
DEF Satellites with a total mass smaller than
10 kg incorporating miniaturized electronic and
mechanical systems
UF *nanosats*
GS artificial satellites
nanosatellites
RT microelectromechanical systems
microminiaturization
microminiaturized electronic devices
microsatellites
satellite constellations
satellite design
small satellite technology
small scientific satellites

nanosats
USE **nanosatellites**

Nozomi Mars Orbiter
(added August 1998)
DEF A Japanese Mars mission spacecraft
designed to study the Martian upper atmosphere
and its interaction with the solar wind, and to
develop technologies for use in future planetary
missions. Specifically, instruments on the
spacecraft enable the measurement of the
structure, composition and dynamics of the
ionosphere, aeronomy effects of the solar wind,
the escape of atmospheric constituents, the
intrinsic magnetic field, and dust in the upper
atmosphere and in-orbit around Mars
UF *Planet-B spacecraft*
GS interplanetary spacecraft
Mars probes
Nozomi Mars Orbiter
Japanese spacecraft
Nozomi Mars Orbiter
unmanned spacecraft
space probes
Mars probes
Nozomi Mars Orbiter
RT aeronomy
Deimos
Phobos
planetary atmospheres
solar planetary interactions

O

optical interconnects
(added June 1998)
GS **optical interconnects**
free-space optical interconnects
RT connectors
electric connectors
integrated optics
optical computers
optical switching
optoelectronic devices
photonics

orbit determination
(added December 1998)
GS **orbit determination**
airborne range and orbit
determination
orbit calculation
minimum variance orbit
determination
orbital position estimation
RT Global Positioning System
position errors
satellite tracking
space navigation
spacecraft control
spacecraft position indicators

P

PDS (spectroscopy)
USE **photothermal deflection
spectroscopy**

perfectly matched layers
(added July 1998)
DEF In the area of computational electro-
magnetism, an absorbing boundary condition used
for terminating infinite domain calculations in the
finite–difference time-domain (FDTD) or finite
element methods. The approach has also been
extended to the analysis of some problems in
acoustics
UF *PML (electromagnetism)*
GS conditions
boundary conditions
perfectly matched layers
RT computational electromagnetics
computational grids
electromagnetic absorption
electromagnetic scattering
finite difference theory
finite element method
Maxwell equation

Phaethon (hypothetical planet)
USE **hypothetical planets**

Phobos spacecraft
(added August 1998)
DEF Two Soviet spacecraft (Phobos 1 and 2,
both launched in July 1988) designed to study the
plasma environment in the Martian vicinity, the
surface and atmosphere of Mars, and the surface
composition of the Martian satellite Phobos. Other
mission objectives included the study of the
interplanetary environment and solar observations
GS interplanetary spacecraft
Mars probes
Phobos spacecraft
Soviet spacecraft
Phobos spacecraft
unmanned spacecraft
space probes
Mars probes

Phobos spacecraft
RT   Mars atmosphere
     Mars environment
     Phobos

photothermal deflection spectroscopy
(added November 1998)
UF   PDS (spectroscopy)
GS   spectroscopy
     photothermal deflection
        spectroscopy
RT   optical measurement
     photoacoustic spectroscopy
     thermal diffusivity
     thermal lensing

planet X
USE   **hypothetical planets**

Planet-B spacecraft
USE   **Nozomi Mars Orbiter**

PML (electromagnetism)
USE   **perfectly matched layers**

polyvinylidene
USE   **vinylidene**

proportional navigation
(added July 1998)
GS   navigation
     proportional navigation
RT   homing
     interception
     line of sight
     missile control
     proportional control
     rendezvous guidance
     terminal guidance

pursuit-evasion games
(added October 1998)
GS   games
     pursuit-evasion games
RT   differential games
     evasive actions
     interception
     optimal control
     pursuit tracking
     trajectory optimization
     zero sum games

R

Reissner-Mindlin plates
USE   **Mindlin plates**

renewable energy
(added December 1998)
GS   **renewable energy**
     geothermal energy utilization
     hydroelectricity
     tidepower
     waterwave energy
     windpower utilization
RT   bioconversion
     biomass energy production
     clean energy
     energy policy
     energy sources
     energy technology
     geothermal energy conversion
     hydrogen-based energy
     ocean thermal energy conversion
     solar energy conversion
     waste utilization
     waterwave energy conversion

Ringleb flow
(added July 1998)
GS   fluid flow
     compressible flow
     Ringleb flow
     steady flow
     Ringleb flow
     two dimensional flow
     Ringleb flow
RT   critical flow
     subsonic flow
     transonic flow

S

scarf joints
(added March 1998)
DEF   A joint in which the overlapping parts are
tapered to form a continuous length, with no
increase in dimension at the joint
GS   joints (junctions)
     scarf joints
RT   bolted joints
     bonded joints
     lap joints
     metal joints
     scarfing

scene generation
(added July 1998)
GS   imaging techniques
     scene generation
     simulation
     scene generation
RT   computer graphics
     flight simulation
     image reconstruction
     scientific visualization
     target simulators

screech tones
(added March 1998)
DEF   Discrete acoustic tones produced by
imperfectly expanded supersonic jets. The
phenomenon is a result of a resonant feedback
condition involving downstream traveling shear-
layer disturbances and upstream traveling
acoustic waves
GS   elastic waves
     sound waves
     noise (sound)
     aerodynamic noise
     screech tones
     frequencies
     acoustic frequencies
     screech tones
RT   aeroacoustics
     feedback
     jet aircraft noise
     jet mixing flow
     nozzle flow
     shear layers
     supersonic jet flow
     supersonic nozzles

seaborgium
(added May 1998)
GS   chemical elements
     seaborgium
RT   bohrium
     dubnium

Sea-viewing Wide Field-of-view Sensor
(added December 1998)
UF   SeaWiFS
GS   scanners
     ocean color scanner

     Sea-viewing Wide Field-of-view
        Sensor
RT   chlorophylls
     Coastal Zone Color Scanner
     ocean surface
     phytoplankton
     remote sensors
     satellite-borne instruments
     water color

SeaWiFS
USE   **Sea-viewing Wide Field-of-view**
        Sensor

Shergotty Nakhla Chassigny meteorites
USE   **SNC meteorites**

Shuttle Superlightweight Tank
USE   **external tanks**
     propellant tanks

SLWT (propellant tank)
USE   **external tanks**
     propellant tanks

smart materials
(added March 1998)
DEF   Engineered materials capable of
responding to their environment to a significant
degree by virtue of intrinsic properties and/or
built-in sensor/actuator elements. Applications of
these materials include vibration suppression/
isolation, precision positioning, damage detection,
and tunable devices
UF   *intelligent materials*
RT   actuators
     composite materials
     electrorheological fluids
     electrostriction
     ferroelastic materials
     ferroelasticity
     ferroelectric materials
     ferromagnetic materials
     materials
     piezoelectric ceramics
     sensors
     shape memory alloys
     smart structures
     vibration damping

SNC meteorites
(added March 1998)
DEF   Meteorites with petrologic character-
istics, isotopic signatures, trapped gas compo-
sitions, and relatively young crystallization ages
(less than 1.3 billion years) which together point
to a Martian origin. The name of these meteorites
is derived from first three known examples—
Shergotty, Nakhla, and Chassigny
UF   *Martian meteorites*
     Shergotty Nakhla Chassigny meteorites
GS   celestial bodies
     meteorites
     stony meteorites
     achondrites
     SNC meteorites
RT   chassignites
     Mars (planet)
     Mars surface
     nakhlites
     shergottites

sonochemistry
USE   **ultrasonic processing**

space station modules
(added November 1998)
GS   modules
     space station modules

Kvant modules
Priroda module
Unity connecting module
Zarya control module
RT air locks
compartments
International Space Station
Mir space station
orbital assembly
space erectable structures
space station structures
spacecraft modules

superhumps (astronomy)
(added October 1998)
RT accretion disks
astronomical photometry
binary stars
cataclysmic variables
dwarf novae
eclipsing binary stars
stellar spectrophotometry

T

thermal lenses
USE **thermal lensing**

thermal lensing
(added November 1998)
UF *thermal lenses*
GS **thermal lensing**
thermal blooming
RT atmospheric optics
focusing
laser beams
photothermal deflection spectroscopy
wave front deformation

time synchronization
(added December 1998)
GS synchronism
time synchronization
RT clocks
frequency standards
frequency synchronization
Global Positioning System
time measurement
time signals
universal time

Titan 4B launch vehicle
(added October 1998)
GS launch vehicles
Titan launch vehicles
Titan 4 launch vehicle
Titan 4B launch vehicle
rocket vehicles
multistage rocket vehicles
Titan launch vehicles
Titan 4 launch vehicle
Titan 4B launch vehicle
RT Cassini mission
laser gyroscopes

TRACE satellite
USE **Transition Region and Coronal Explorer**

Transition Region and Coronal Explorer
(added May 1998)
DEF Small Explorer Mission satellite
supporting the investigation of the relationships
between fine-scale magnetic fields and their

associated plasma structures in the transition
region and lower corona of the Sun
UF *TRACE satellite*
GS artificial satellites
scientific satellites
Explorer satellites
Transition Region and Coronal Explorer
RT chromosphere
SOHO Mission
solar atmosphere
solar corona
solar magnetic field
solar observatories
solar physics
solar transition region

transplutonic planets
USE **hypothetical planets**

Trefftz method
(added July 1998)
DEF Boundary-type approximation scheme
for the solution of boundary value problems for
partial differential equations
UF *hybrid-Trefftz finite element method*
GS analysis (mathematics)
numerical analysis
approximation
boundary element method
Trefftz method
RT bending theory
boundary conditions
boundary value problems
finite element method
partial differential equations
plate theory
structural analysis

TRMM satellite
(added May 1998)
DEF Satellite supporting the joint
US–Japanese Tropical Rainfall Measuring Mission
(TRMM) to explore tropical rainfall and its effects
on the Earth energy budget, general circulation,
and climate. The TRMM satellite represents the
first dual deployment of a precipitation radar and
passive microwave radiometer on an Earth-
viewing satellite
UF *Tropical Rainfall Measuring Mission sat*
GS artificial satellites
meteorological satellites
TRMM satellite
scientific satellites
TRMM satellite
RT atmospheric circulation
Earth radiation budget
equatorial atmosphere
rain
tropical meteorology

Tropical Rainfall Measuring Mission sat
USE **TRMM satellite**

U

ultrasonic processing
(added June 1998)
DEF The use of ultrasonic radiation to
synthesize a compound or material, or alter the
structure, properties, or form of a material
UF *sonochemistry*
ultrasonic treatment
RT processing
ultrasonic cleaning
ultrasonics

ultrasonic treatment
USE **ultrasonic processing**

Unity connecting module
(added November 1998)
DEF Component of the International Space
Station providing six ports that serve as
connecting points for other station modules and
framework elements
GS modules
space station modules
Unity connecting module
RT International Space Station
spacecraft docking

V

very large transport aircraft
(added November 1998)
DEF Aircraft capable of a maximum takeoff
weight greater than 400 metric tons (881 600 lbs)
or having a seating capacity greater than 660
UF *VLTA (aircraft)*
GS transport aircraft
very large transport aircraft
RT cargo aircraft
passenger aircraft

VLTA (aircraft)
USE **very large transport aircraft**

W

water sampling
(added March 1998)
DEF The process of obtaining a represen-
tative sample of water from any natural or artificial
environment
GS sampling
water sampling
RT environmental monitoring
ground water
pollution monitoring
sea water
surface water
water
water pollution
water quality

wave rotors
(added March 1998)
DEF Rotor devices that use gasdynamic
waves to transfer energy rather than the motion of
solid surfaces. Typically they consist of a series
of passages arranged on a drum which rotates
about an axis. Through rotation, the ends of the
passages are periodically exposed to various
circumferentially arranged ports which initiate the
traveling expansion or compression waves within
the passages. The particular circumferential
location of the ports determines the thermo-
dynamic cycle of the working fluid
GS rotating bodies
rotors
wave rotors
RT compression waves
energy transfer
engine parts
gas dynamics
gas generators
gas turbine engines
topping cycle engines
turbomachinery
turboshafts
wave generation

wing–body and tail configurations
  USE   **body–wing and tail configurations**

wing–body configurations
  USE   **body–wing configurations**

X

X-32 aircraft
  (added October 1998)
  DEF   Experimental supersonic strike fighter developed to be configured as a conventional or short takeoff/vertical landing vehicle. Developed as part of the Joint Strike Fighter (JSF) program.
  GS   Boeing aircraft
          X-32 aircraft
        jet aircraft
          X-32 aircraft
        research vehicles
          research aircraft
            X-32 aircraft
        supersonic aircraft
          X-32 aircraft
        V/STOL aircraft
          X-32 aircraft

X-35 aircraft
  (added October 1998)
  DEF   Experimental strike fighter incorporating a vertical lift fan for short takeoff/vertical landing capability. Developed as part of the Joint Strike Fighter (JSF) program.
  GS   jet aircraft
          X-35 aircraft
        Lockheed aircraft
          X-35 aircraft
        research vehicles
          research aircraft
            X-35 aircraft
        V/STOL aircraft
          X-35 aircraft

Z

Zarya control module
  (added November 1998)
  DEF   Component of the International Space Station providing propulsion, steering, and communications during the early assembly stages of the station; later serving as a docking port and fuel tank. Zarya was built by Russia under contract to the U.S. and is owned by the U.S.
  GS   modules
          space station modules
            Zarya control module
  RT   International Space Station

zero sum games
  (added October 1998)
  GS   games
          zero sum games
  RT   differential games
        Markov processes
        optimal control
        pursuit-evasion games
        saddle points (game theory)

NASA THESAURUS SUPPLEMENT

PART 2
ROTATED TERM DISPLAY

NUMERALS

Deep Space   1 Mission
H-   2 control
Delta   3 launch vehicle
Delta   4 Launch vehicle
Titan   4B launch vehicle
X-   32 aircraft
X-   35 aircraft
Boeing   717 aircraft

A

Darkstar unmanned   aerial vehicle
use: pilotless aircraft
reconnaissance aircraft
Boeing 717   aircraft
very large transport   aircraft
VLTA   (aircraft)
use: very large transport aircraft
X-32   aircraft
X-35   aircraft
Alpha Magnetic Spectrometer
AMS (Spectrometer)
use: Alpha Magnetic Spectrometer
antenna gain
antiphase boundaries
antiphase domains
use: antiphase boundaries
APB (materials)
use: antiphase boundaries
superfluids   (astronomy)
embedded   atom method
modified embedded   atom method
use: embedded atom method

B

Planck-   B spacecraft
use: Nozomi/Mars Orbiter
ionic   bands
Euler-Bernoulli   beam theory
use: Euler-Bernoulli beams
Euler-Bernoulli   beams
Euler-   Bernoulli beam theory
use: Euler-Bernoulli beams
Euler-   Bernoulli beams
Biot-Savart law
wing-   body and tail configurations
use: body-wing and tail configurations
wing-   body configurations
use: body-wing configurations
Boeing 717 aircraft
bohrium
Hale-   Bopp comet
antiphase   boundaries

C

digital   cameras
cascode devices
Shergotty Nakhla   Chassigny meteorites
use: SNC meteorites
E-RU (physical   chemistry)
10E-RU (physical   chemistry)
use: embedded atom method
clamped structures
Hale-Bopp   comet
free-space optical   communication
enantiomeric   compounds
use: enantiomers
nacelle-wing   configurations
use: wing-nacelle-configurations
wing-body   configurations
use: body-wing configurations
wing-body and tail   configurations
use: body-wing and tail configurations
Unit   connecting module
H-2   control
Zarya   control module
Transition Region and   Coronal Explorer
corrugated waveguides
cycloaddition
Darkstar unmanned aerial vehicle
use: pilotless aircraft
reconnaissance aircraft

D

Deep Space 1 Mission
photothermal   deflection spectroscopy
deformable mirror
Delta 3 launch vehicle
Delta 4 launch vehicle
orbit   determination
cascode   devices
MEMS electromechanical   devices)
use: microelectromechanical systems
dielectric waveguides
differential games
digital cameras
antiphase   domains
use: antiphase boundaries
DS1 space mission
use: Deep Space 1 Mission
dubnium

E

EAM (physical chemistry)
use: embedded atom method
PML   (electromagnetism)
use: perfectly matched layers
MEMS   (electromechanical devices)
use: microelectromechanical systems

NASA THESAURUS SUPPLEMENT

PART 3
CHANGES

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The NASA Thesaurus Supplement is a cumulative update to the 1998 edition of the NASA Thesaurus (NASA/SP-1998-7501). The Supplement, published every 6 months, includes all new terms and associated hierarchies added since the cutoff for the 1998 edition (December 1997). Parts 1 and 2 (Hierarchical Listing and Rotated Term Display) correspond to Volumes 1 and 2 of the 1998 printed edition of the NASA Thesaurus. Definitions are included in Part 1; uppercase/lowercase forms are provided in both Parts 1 and 2. Part 3 is a list of deletions or changes to valid terms.

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